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**Evaluation and Assessment of Economic Losses
on Account of Inadequate Post-Harvest
Infrastructure Facilities for Fisheries Sector in
Gujarat State**

H. Sharma, M. Swain & S. S. Kalamkar

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Agro-Economic Research Centre

For the States of Gujarat and Rajasthan

(Ministry of Agriculture & Farmers Welfare, Govt. of India)

Sardar Patel University

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Economic Losses on Account of Inadequate Post-Harvest Infrastructure for Marine Fisheries in Gujarat*

H. Sharma, M. Swain & S. S. Kalamkar¹

Abstract

The aim of the study was to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector in Gujarat, India.. The primary data were collected during month of October 2015 covering three periods spread in the year 2014-15 (October 2014 to September 2015) from three fishing harbours i.e. Veraval, Porbandar and Mangrol of Gujarat. It was observed that The post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period. Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured. The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus in view of less availability of ice, the quality of fish deteriorates very fastly. The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor. Therefore, there is a need of expansion of harbor regions as well as constructions of more number of jetting/landing platforms.

Key Word: Fishery sector, production and conservation, post harvest losses

JEL Classification: Q11, Q22, L17

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1. Backdrop

The fisheries sector plays an important role in the Indian economy. It contributes to the national income, exports, food and nutritional security and in employment generation. This sector is also a principal source of livelihood for a large section of economically underprivileged population of the country, especially in the coastal areas. This sector provides livelihood to approximately 14.49 million people in the country. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a source of foreign exchange earner. The fisheries sector is rarely a strategic sector for national economic development. Although it plays a prominent role in developing States rich fishery resources relative to their populations, it is nonetheless an important economic activity, and very often a strategic one, in many coastal regions of India.

The fisheries and aquaculture in India are vibrant economic activities, and have been one of the fastest growing food production systems during the last three decades. Their significance and contribution towards agricultural (4.75 per cent GDP in 2012-13 at current prices) and national economies (0.83 percent to national GDP in 2012-13 at current prices), livelihood and nutritional security, employment generation (14.49 million people) and foreign exchange earnings (over Rs. 33441 crores in 2014-15) have been enormous though understated so far. Out of the total fish production in India, about 65 percent production is from resources inland and remaining 35 percent from marine sources.

Marine fisheries constitute a valuable source of food and employment and a net contributor to the balance of payment. Marine fisheries have progressively increased by nearly six times during the last five decades period. The estimated marine resources potential of the Indian Exclusive Economic Zone (EEZ) is 4.24 million metric tonnes at the present exploitation rate. The country has a long coastline of 8118 km and equally large areas under estuaries, backwaters, lagoons, etc. conducive for developing capture as well as culture fisheries. With the declaration of the EEZ in 1977, an area of 2.02 million sq km. (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60 sq.km around the Andaman & Nicobar Islands) was protected for fisheries. The East Coast covers four states and two Union Territories (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Pondicherry and Andaman & Nicobar Islands) and the West Coast covers five states and two Union Territories (Gujarat, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala, and Lakshadweep). The maximum length of coast line (1912 km) is

from Andaman & Nicobar Island followed by Gujarat (1600 km) (see, Table 1). Thus, Gujarat state accounts for about one fifth of length of coast line of our country. Fish production in India has shown an increasing trend from 0.75 million metric tonnes (MMT) in 1950-51 to reach 10.07 MMT in 2014-15 as depicted in Table 2.

Table 1: Statewise Coast Line and Continental Shelf area (2012)

Sr. No.	State	Length of Coast line (Km)	Continental Shelf ('000 sq. km.)
1	Andhra Pradesh (Undivided)	974	33
2	Goa	104	10
3	Gujarat	1600	184
4	Karnataka	300	27
5	Kerala	590	40
6	Maharashtra	720	112
7	Odisha	480	26
8	Tamilnadu	1076	41
9	West Bengal	158	17
10	A & N Island	1912	35
11	Daman & Diu	27	NA
12	Lakshwadeep	132	4
13	Pondicherry	45	1
14	Total	8118	530

Source: GOI (2011).

Table 2: Fish Production in India (1950-51 to 2013-14)

Year	Fish Production ('000 tonnes)			Average Annual Growth Rate (%)		
	Marine	Inland	Total	Marine	Inland	Total
1950-51	534	218	752	-	-	-
1960-61	880	280	1160	9.53	3.05	7.65
1970-71	1086	670	1756	6.36	6.43	6.39
1980-81	1555	887	2442	4.22	4.6	4.36
1990-91	2300	1536	3836	1.1	9.56	4.32
2000-01	2811	2845	5656	-1.44	0.78	-0.33
2010-11	3250	4981	8231	4.7	1.78	2.91
2011-12	3372	5294	8666	3.75	6.28	5.28
2012-13	3321	5719	9040	-1.51	8.03	4.32
2013-14	3443	6136	9579	3.67	7.29	5.96

Source: GOI (2014), Handbook of Fisheries Statistics.

With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture has shown in this periods. In case of marine fisheries, production has increased from 0.53 MMT in 1950-51 to 3.44 MMT in 2013-14. The annual growth rate of marine fish production has fluctuated sharply. It increased from 2.32 per cent in 1955-56 to 9.53 per cent in 1960-61 and stood at 25.21 per cent during 1989-90. Growth rate was negative during the 1965-66, 1981-83, 1986-88, 1997-99 and 2003-05. Since 2008-09, growth rate has been positive except during 2012-13.

Among the states, Andhra Pradesh and West Bengal have emerged as the leading producers of inland fish during 2014-15 accounting 26 and 23 percent of total inland production respectively, followed by Bihar (7.0 %). It can be seen from the Table 3 that these three states together accounted for more than 55 percent of inland fish production in India in 2013-14. In case of marine fish production, Gujarat has emerged as the leading producer (accounts 20.20 % in total) followed by Kerala (15.17 %), Maharashtra (13.58%), Andhra Pradesh (12.73%) and Tamilnadu (12.55%).

Thus these five major states together accounted for about 74 percent of total marine fish production in India. However, there are appreciable losses during both harvest and post-harvest stages in fisheries. It is important to know the nature and causes of losses in fish value.


In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. About 35 per cent of Indian population is fish eaters and the per capita consumption is 9.8 kg whereas the recommended intake is 13 kg (Srinath et al., 2008; GOI, 2011). The marine fish production has also been stagnating over recent years (CMFRI, 2004). As per FAO, the post harvest loss in world fisheries is 10 per cent. Post-harvest Food Loss (PHL) in general is defined as the measurable qualitative and quantitative loss along the supply chain, starting at the time of harvest till its consumption or other end uses (De Lucia and Assennato, 1994; Hodges, Buzby and Bennett, 2011). Though the fishery sector has transformed in terms of its nature and significance, there are challenges yet to be addressed but reducing or if possible, eliminating economic losses of fisheries due to inadequate post-infrastructure (PHI) facilities is one of the most important of them. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer.

Adequate provisions of such infrastructure may result in the utilization of fish in a cost-effective and efficient way and absence of such required infrastructure facilities result in considerable wastage and losses. As there is limited scope for horizontal expansion to cope with the public food demand,

Table 3: State wise Inland and Marine Fish Production in India (2013-14)

States/UTs	Production (in ' 000 Tonnes)			Share in total production (%)		
	Marine	Inland	Total	Marine	Inland	Total
A and Nicobar Islands	36.75	0.2	36.95	1.07	0.00	0.38
Andhra Pradesh	438.25	1580.17	2018.42	12.73	25.75	20.68
Arunachal Pradesh	0	0.55	0.55	0.00	0.01	0.01
Assam	0	266.7	266.7	0.00	4.35	2.73
Bihar	0	432.3	432.3	0.00	7.05	4.43
Chandigarh	0	0.11	0.11	0.00	0.00	0.00
Chhattisgarh	0	284.96	284.96	0.00	4.64	2.92
Dadra and Nagar Haveli	0	0.05	0.05	0.00	0.00	0.00
Daman and Diu	18.78	0.23	19.01	0.55	0.00	0.19
Delhi	0	0.88	0.88	0.00	0.01	0.01
Goa	109.57	4.49	114.06	3.18	0.07	1.17
Gujarat	695.58	97.84	793.42	20.20	1.59	8.13
Haryana	0	116.9	116.9	0.00	1.91	1.20
Himachal Pradesh	0	9.83	9.83	0.00	0.16	0.10
Jammu and Kashmir	0	19.98	19.98	0.00	0.33	0.20
Jharkhand	0	104.82	104.82	0.00	1.71	1.07
Karnataka	357.36	197.95	555.31	10.38	3.23	5.69
Kerala	522.31	186.34	708.65	15.17	3.04	7.26
Lakshadweep	18.72	0	18.72	0.54	0.00	0.19
Madhya Pradesh	0	96.26	96.26	0.00	1.57	0.99
Maharashtra	467.46	135.22	602.68	13.58	2.20	6.18
Manipur	0	28.54	28.54	0.00	0.47	0.29
Meghalaya	0	5.75	5.75	0.00	0.09	0.06
Mizoram	0	5.94	5.94	0.00	0.10	0.06
Nagaland	0	7.47	7.47	0.00	0.12	0.08
Odisha	120.02	293.77	413.79	3.49	4.79	4.24
Puducherry	37.81	4.27	42.08	1.10	0.07	0.43
Punjab	0	104.02	104.02	0.00	1.70	1.07
Rajasthan	0	35.1	35.1	0.00	0.57	0.36
Sikkim	0	0.42	0.42	0.00	0.01	0.00
Tamil Nadu	432.27	192.03	624.3	12.55	3.13	6.40
Telangana	0	0	0	0.00	0.00	0.00
Tripura	0	61.95	61.95	0.00	1.01	0.63
Uttar Pradesh	0	464.48	464.48	0.00	7.57	4.76
Uttarakhand	0	3.89	3.89	0.00	0.06	0.04
West Bengal	188.24	1392.41	1580.65	5.47	22.69	16.20
India	3443.12	6135.79	9578.91	100.00	100.00	98.16

Source: www.indianstat.com



vertical intensification through integration of different farm based enterprises and post-harvest loss reductions could help to meet expected increase in production demand and quality (Kevin, 2006). Thus, post-harvest fish losses are one of the immediate policy concerns as it happens in most of the fish distribution chains in India.

The present study is an attempt to overcome all these challenges in order to evaluate and assess the economic losses due to inadequate post-harvest infrastructure facilities for fisheries sector in Gujarat state, which is an important contributor to marine fishery resources in India.

2. Objective and Methodology of the Study

- 1) To examine the growth, composition and the contribution of the fisheries sector in Gujarat;
- 2) To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in the state;
- 3) To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in the state;
- 4) To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in the state; and
- 5) To arrive at relevant policy implications for development of marine fishery in the state.

The study is based on both primary and secondary data. The secondary data were collected from published sources as well as from the Department of Fisheries, Government of Gujarat. The primary data were collected during month of October 2015 covering three periods spread in the year 2014-15 (October 2014 to September 2015) from three fishing harbours i.e. Veraval, Porbandar and Mangrol of Gujarat (see, Figure 1). These fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in Gujarat. From each site, Table 4 presents the number of stakeholders involved in the supply chain viz. boat owner (30), fishermen (30), wholesalers (10), retailers (10) and small processors (6) and exporters (6) including the administrators were interviewed to collect information on the various aspects including fish quality and loss assessment data.

Figure 1: Selected Fishing Harbours in Gujarat state




Table 4: Number of Selected Sample Stakeholders

Fishing Harbours	Sample Size			
	Category - 1 FH/FJ/FLC	Category – 2 Fish Market	Category – 3 Fish Processing Centre	Category – 4 Fishery Officials
Veraval Porbandar Mangrol	A*	Wholesaler-15 Retailer-30 Consumer-30	Exporter -6 Small Scale/local Processor -6	Officials - 6
Total	60	75	12	6

Notes: *A - Fish Boat owners/crew = 30; Fishermen to haul the catches = 30, FH (Fishing Harbour), FJ (Fishing Jetties), FLC (Fish Landing Center)

3. Fisheries Development in Gujarat (focus on Marine Fisheries)

Gujarat is the northern most maritime State on the west coast of India situated between 20.6 and 24.42 degrees latitude and 68.10 and 74.28 degrees east longitude. Gujarat has one of the richest fishing grounds in India and the most important commercial varieties of fish (such as Pomfret, Hilsa, Bombay duck, Ribbon fish, Catfish, Rays, Cuttle fish, Shrimps etc.). Thus, Gujarat possesses a vast resource with favourable climates and environment condition for flourishing fish production through aquaculture.



Gujarat is endowed with a wide range of marine and inland aquatic resources. The state has a long coastline extending to 1600 km accounts for 19.70 per cent of the total coastline of the country and about 46 per cent of the western coastline of India. It has a continental shelf area of 0.18 million km², Exclusive Economic Zone (EEZ) of 0.214 million km², which occupies 32 per cent of the continental shelf area and 10 per cent of the total EEZ of India. The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries. The major fisheries resources of the state include Elasmobranches, Bombay ducks, Sciaenids, Shrimps, Seer fishes, Tunas, Threadfin Breams, Pomfrets, Catfishes, Lizard fishes, Bull's eyes, Carangids, Anchovies, Ribbon fishes, Croakers, Prawns, Lobsters and Cephalopods. Along the coastline of Gujarat, 851 fishing villages/towns and 286 marine landing centers are located. Gujarat has 123 fish landing centers located in 226 fishing village (Table 5). About 19 per cent of the landing centers are located in Valsad district followed by 15.45 per cent in Kutch district and 13.82 per cent each in Jamnagar and Junagarh and 8.13 per cent in Surat district. About 55062 fisherman family and 316972 fisher folk population is located in fishing villages.

Over the last five decades, fisheries sector of Gujarat has undergone radical changes. While marine resources of Gujarat are spread mainly in the Arabian sea, the inland waters in the form of rivers, canals, estuaries, ponds, reservoirs, brackish water impoundments, waterlogged areas etc. constitute a bed rock of inland fisheries in the state. The total fish production in the State has increased by almost ten times during last five decades period, i.e. from 0.79 lakh metric tonnes in 1960-61 to 7.93 lakh MT in 2013-14. The state has taken necessary steps in order to achieve the targets fixed for both inland and marine fish production in State. Out of the total production of 7.93 lakh MT in 2013-14, about 88 percent was marine fish while remaining 12 per cent was inland fish production. Thus marine fish dominates the fish production in Gujarat. Gujarat is the third highest fish producer in India (after West Bengal and Andhra Pradesh) and the largest producer of marine fish.

However, Gujarat's share in the total fish production has been fluctuating in volume terms and has come down in value terms in the last decade. The main reason could be the declining fish catch and quality of catch. It is reported that 35 per cent of the catch in the marine sector is low value miscellaneous fish. As mentioned earlier, in total marine fish production in the state, small sciaenid accounts for around 27 per cent followed by Bombay duck (14.30%), ribbon fish (5.63 %), Cuttle fish (3.85%) and catfish (3.6 %) in the year 2012-13.

Table 5: District-wise Fishery Resource Status in Gujarat (2012-13)

District	App. Length of coast line (kms)	Number of landing centers	Number of fishery villages	No. of fisherman family	Fisher Folk Population
Valsad	63 (3.9)	23 (18.7)	25 (11.1)	10673 (19.4)	55851 (17.6)
Navsari	27 (1.7)	9 (7.3)	11 (4.9)	5364 (9.7)	24748 (7.8)
Surat	83 (5.2)	10 (8.1)	19 (8.4)	2252 (4.1)	11863 (3.7)
Bharuch	127 (7.9)	9 (7.3)	19 (8.4)	1273 (2.3)	6419 (2.0)
Anand	51 (3.2)	1 (0.8)	1 (0.4)	312 (0.6)	1694 (0.5)
Rajkot	26 (1.6)	1 (0.8)	1 (0.4)	140 (0.3)	870 (0.3)
Kachchh	406 (25.4)	19 (15.4)	65 (28.8)	4122 (7.5)	19694 (6.2)
Jamnagar	342 (21.4)	17 (13.8)	26 (11.5)	5982 (10.9)	40900 (12.9)
Bhavnagar	152 (9.5)	9 (7.3)	23 (10.2)	1351 (2.5)	6862 (2.2)
Porbandar	105 (6.6)	5 (4.1)	23 (10.2)	6048 (11.0)	32639 (10.3)
Junagadh	156 (9.8)	17 (13.8)	6 (2.7)	14704 (26.7)	88274 (27.8)
Amreli	62 (3.9)	3 (2.4)	7 (3.1)	2841 (5.2)	27158 (8.6)
Total	1600 (100.0)	123 (100.0)	226 (100.0)	55062 (100.0)	316972 (100.0)

Note: The figures in parentheses are the percentage of respective total.

Source: GOG (2013), Gujarat Fisheries Statistics 2012-13.

The data on districtwise marine production in Gujarat during 2004-05 to 2014-15 is presented in Table 6 indicate that Junagadh district contributes the bulk of the marine landings (40.79%), followed by Valsad (13.39%), Porbandar (13.28%), Kutch (10.12%), Jamnagar (9.73%), Amreli (7.26%) and Navsari (4.0%). The remaining districts such as Bhavanagar, Rajkot, Surat, Baruch and Kheda accounts for less than one percent share in total. The Saurashtra coast between the Gulf of Kutch and Gulf of Cambay, presents unique oceanographic features and is endowed with a wide variety of highly relished table fishes. An incredible achievement of the state has been made in the foreign exchange earnings through export of fish and fish products.

There are 5 fish harbours existing in the state. They are located in Dholai, Jakhau, Veraval, Mangrol and Porbandar with total fish production capacity of 388000 metric tons and another 5 harbours have been proposed to be established in the state (Table 7). Junagadh district has two major harbors, viz. Mangrol and Veraval are with the highest fish production capacity of 235000 MT. Out of 14200 fishing crafts, 6500 are in Veraval, 3500 are in Porbandar and 2800 are in Mangrol. As per 2007 Census, the state had 28706 boats; of which 18536 boats were mechanized and 10170 boats were non- mechanized. In the year 2012-13, total 36770 boats were in-operation near Gujarat coast, of

these 24612 boats were mechanized and 12158 boats were non- mechanized. During the period from 2000-01 to 2012-13, annual rate of growth of fishing boats was estimated to be 1.88 per cent, while same was 2.86 percent per annum for mechanized boat. However, rate of growth was negative in case of non-mechanized during the same period.

Table 6: Districtwise Marine Fish Production in Gujarat

District	Marine Fish Production in Gujarat ('000 tonnes)											% share in total (2014-15)	CAGR (2004-05 to 2014-15)
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15		
Valsad	78.6	79.1	57.7	41.5	35.2	81.4	87.5	87.6	88.5	92.9	92.8	13.29	1.52
Navsari	33.6	34.7	30.0	15.5	8.7	11.3	19.4	20.2	26.6	28.6	28.4	4.06	-1.52
Surat	8.7	11.2	10.4	9.5	3.5	4.5	2.5	3.2	3.2	3.5	3.5	0.50	-7.91
Bharuch	1.5	1.6	3.8	6.4	6.9	6.1	5.8	6.4	4.8	4.0	3.5	0.49	7.87
Anand	2.6	3.0	2.3	0.3	0.4	0.5	0.3	0.5	0.4	0.3	0.3	0.04	-18.65
Rajkot	1.9	1.5	2.7	2.3	1.0	1.0	1.1	1.0	0.5	0.6	0.2	0.03	-17.46
Kachchh	64.7	62.4	59.4	58.7	53.3	60.4	73.0	72.9	72.8	70.3	70.7	10.12	0.81
Jamnagar	45.9	66.5	65.2	59.2	62.6	88.3	67.5	67.1	67.8	68.1	68.0	9.73	3.63
Amreli	59.3	66.8	77.8	161.5	200.8	101.9	60.7	60.6	57.6	50.6	50.7	7.26	-1.41
Junagadh	233.3	281.5	300.8	259.8	250.8	265.0	280.2	280.9	278.1	283.0	284.9	40.79	1.83
Porbandar	49.9	51.0	60.4	61.6	56.4	63.4	88.6	89.6	90.8	91.5	92.8	13.28	5.80
Bhavnagar	5.0	4.6	6.3	4.6	4.4	3.6	2.2	2.6	2.4	2.1	2.8	0.39	-5.16
Total	585.0	663.9	676.8	680.8	683.9	687.4	688.9	692.5	693.6	695.6	698.5	100.0	

Source: GOG (2015), Fishery Statistics 2014-15, Commissioner of Fisheries, Government of Gujarat, Gandhinagar.

Table 7: District wise major fish harbours and their capacity (2014)

District	No. of	Name of Harbours	Fish Production	No. of Fish	No. of Fishing
Valsad	-	-	-	-	-
Navsari	1	Dholai	15000	10	400
Surat	-	-	-	-	-
Bharuch	-	-	-	-	-
Anand	-	-	-	-	-
Rajkot	-	-	-	-	-
Kachchh	1	Jakhau	53000	10	1000
Jamnagar	-	-	-	-	-
Amreli	-	-	-	-	-
Junagadh	2	Veraval, Mangrol	235000	12	6500, 2800
Porbandar	1	Porbandar	85000	10	3500
Bhavnagar	-	-	-	-	-
Gujarat	5		388000	42	14200

Source: GOG (2015).

4. Fisheries Policies and Programmes in Gujarat

The state level fisheries management is undertaken mainly through licensing, prohibitions on certain fishing gear, regulations on mesh size and establishment of closed seasons and areas, under the Marine Fishing Regulation Act (MFRA). Zones are demarcated by each State based on distance from the shoreline (from 5 km to 10 km) or on depth. These in-shore zones, where trawling and other forms of mechanized fishing are not permitted, are perhaps the most important space-based fisheries management measure in place. The closed season or 'monsoon fishing ban' is another important 'temporal-spatial' management measure implemented on both the east and west coasts of India for a period of 47 days and 65 days respectively, considered to be the spawning and breeding season.

Central Govt. has drafted a Model Bill pertaining to Fisheries Management in the states and circulated it as an advisory exercise to all the states. Various states such as Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and Pondicherry landed to the advice and have drawn up their Marine Fishing Regulation Act (MFRA). Gujarat has adopted its Fisheries Act in 2003, which was published in "Gujarat Government Gazette", on the 12th March, 2003. The main objective of the Act is to provide protection, conservation and development of fisheries in inland and territorial waters of the State of Gujarat and for regulation of fishing activities in the State.

The State Government of Gujarat is also implementing various need based programmes like: assistance to the fishing vessels for purchasing electrical equipments, life saving equipments, Distress Alert Transmission (DAT), fishing nets, insulated boxes, solar lights, assistance for fish marketing to women, assistance to artisanal fishermen, training to fishermen and extension services. Fish landing centers are also upgraded by the State Government. Some of the major schemes implemented for development of fishermen in the state are:

- (a) Subsidy for acquiring Modern Equipments
- (b) Relief to families of the fishermen captured by Pakistani Authority
- (c) Motorisation/Mechanization of Traditional Craft/Boats
- (d) Safety Measures on Fishing Boats
- (e) Processing, Preservation and Marketing
- (f) Purchase of Gill Nets for Small and Pagadiya Fishermen
- (g) Assistance for Women Self Help Group of Fishing Community
- (h) Scheme for having hygienic or portable toilets on fishing boats
- (i) Assistance for Training of Schedule Caste Youth Fishermen

- (j) Schemes for Fishing Activities in Salty Water
- (k) Housing scheme for Fishermen
- (l) Scheme for Fish Seeds Growing and Collection
- (m) Scheme for Boat/ Fishing Nets
- (n) Assistance for Purchase of Plastic kits (boxes) for transporting fish
- (o) Assistance for establishing group hatchery for colorful fishes.
- (p) Group Accident Insurance Scheme for active fishermen

5. Findings from Primary Survey

5.1 Fishing Activities, Facilities & Constraints faced by Fishermen & Boat Owners

Among different fishing crafts and fishing gears available with selected respondents are presented in Tables 8 to 10, high concentration of motorized crafts/boats was observed. On an average of both categories, per household had 2.08 motorised crafts and 0.23 traditional crafts. The boat owners had more number of both the crafts per household than fishermen, i.e. 3.17 motorized crafts/hh as compared to 1.0 motorized craft/ha with fishermen. Across the harbors, Mangrol respondents had highest number of crafts (3.15) followed by Veraval (2.20) and the lowest was in Porbandar (1.60).

The type of fishing gears used varied by type of fishing operation and target species. Trawlers and Gill nets were commonly used in family fishing as they were relatively of low cost. On an average, every household (both groups together) had 7.32 trawlers and 2.98 gill netters. Besides every household possessed other gears such as purse seine and cast net (4.32), deep sea trawlers (0.75) and very few households had long lines tuna, squid jigging and shore seining. Across harbors, the highest number of trawlers per household was observed in Veraval, while Mangrol respondents had the highest number of gill netters and other gears/hh.

Table 8: Number of Fishing Crafts (Boats)/Gears- Boat Owners & Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (BO & FM)			
		Porbandar	Veraval	Mangrol	Overall
A	Fishing Crafts/Boats				
	a) Traditional Crafts/Boats	0.00	0.14	0.55	0.23
	b) Motorized Crafts/Boats	1.60	2.05	2.60	2.08
	c) Mechanized Boats/Boats	0.00	0.00	0.00	0.00
	Total	1.60	2.20	3.15	2.32
B	Fishing Gears/tools				
	a) Trawlers	7.90	8.35	5.70	7.32
	b) Gill netters	0.30	4.30	4.35	2.98
	c) Deep Sea Trawlers	0.55	0.80	0.90	0.75
	d) Long liners for Tuna	0.00	0.00	0.15	0.05
	e) Squid Jigging	0.00	0.00	0.20	0.07
	f) Shore seining	0.00	0.00	0.5	0.17
	g) Others (Purse Seine &Cast nut)	2.70	4.35	5.90	4.32

Note: BO- Boat Owner, FM- Fishermen.
Source: Field Survey Data.

Table 9: Number of Fishing Crafts (Boats)/ Gears with Boat Owners

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (BO)			
		Porbandar	Veraval	Mangrol	Over all
A	Fishing Crafts (by design)				
	a) Traditional Crafts	0.0	0.30	0.80	0.37
	b) Motorized Crafts	2.20	3.10	4.20	3.17
	c) Mechanized Boats	0.0	0.0	0.0	0.0
	Total	2.20	3.40	5.00	3.53
B	Fishing Vessels (by use)				
	a) Trawlers	5.30	2.90	3.00	3.73
	b) Gill netters	0.20	8.00	8.40	5.53
	c) Deep Sea Trawlers	0.0	0.20	0.60	0.27
	d) Long liners for Tuna	0.0	0.0	0.20	0.07
	e) Squid Jigging	0.0	0.0	0.40	0.13
	f) Shore seining	0.0	0.0	0.80	0.27
	g) Others (Cast nut & Purse Seine)	3.40	5.70	6.80	5.30

Source: Field Survey Data.

Table 10: Number of Fishing Crafts (Boats)/ Gears with Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (FM)			
		Porbandar	Veraval	Mangrol	Over all
A	Fishing Crafts (by design)				
	a) Traditional Crafts	0.00	0.00	0.30	0.10
	b) Motorized Crafts	1.00	1.00	1.00	1.0
	c) Mechanized Boats	0.00	0.00	0.00	0.0
	Total	1.00	1.00	1.30	1.10
B	Fishing Vessels (by use)				
	a) Trawlers	10.50	13.80	8.40	10.90
	b) Gill netters	0.40	0.60	0.30	0.43
	c) Deep Sea Trawlers	1.10	1.40	1.20	1.23
	d) Long liners for Tuna	0.00	0.00	0.10	0.03
	e) Squid Jigging	0.00	0.00	0.00	0.00
	f) Shore seining	0.00	0.00	0.50	0.17
	g) Others (Cast net & Purse Seine)	2.00	3.00	5.00	3.33

Source: Field Survey Data.

In view of fisheries situation that exists in west coast of India, temporal restrictions, i.e., seasonal closure of fishing is implemented independently by each State government to manage the fishery resources. It is also known as monsoon ban period declared every year during south west monsoon period of 90 days in Gujarat (15th of May to 15th of August) (Table 11). It is due to the fact that fish come closer to the shore and estuary during breeding. During this period, maintenance works of vessels are taken up. Fishing season varies along the coastal belt. Therefore ban period ranges between 30 to 145 days in different coastal states of India. The ban period for fishing also helps somehow in fishery resources management as there are clear signals that resources in the inshore are being fully exploited and the scope for increasing production from the present level is limited.

Table 11: Details on Fishing Ban Period in Selected Harbours

Sr. No.	Harbour	Fishing Ban period	
		Ban Period	Length (days)
A	Porbandar	15 May to 15 August	90 days
B	Veraval	15 May to 15 August	90 days
C	Mangrol	15 May to 15 August	90 days

Source: Field Survey Data & Office of Commissionerate of Fisheries, GOG.

The details on seasonwise hourbourwise fishing activities by selected boat owners and fishermen are presented in Table 12 which shows that on an average, the fishing days per season were estimated to be 64.9 days, (ranges between 65-69 days in three selected seasons during 2014-15). The highest fishing days were recorded in October-December period (67.2 days), followed by January-March period (66.8 days) and lowest were in April to September period (60.8 days), which may be due to 90 days fishing ban during this season. Every season, around 6-7 trips were made (around 13-14 days per trip) with around 7 persons on board. In case of Porbandar and Veraval, all trips were multi-days fishing (ranges between 6-18 days), while 90 percent of trips of Mangrol respondents were multi-days and remaining 10 percent were a day fishing trips. Across both the groups, more than 95 percent of respondents had used motorized boat for fishing. The use of traditional crafts has been observed in Veraval and Mangrol harbor, while its share in total trips made was hardly 1-2 percent in the both groups. The average number of fishermen on board was 7.5 in case of boat owner, while same were 6.9 people in case of fishermen.


Table 12: Harbourwise and Season wise Details of Fishing Activities (All)

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Porbandar	Veraval	Mangrol	Av.
1	Oct - Dec 2014					
A	Fishing days per season	Av no.	66.6	66.4	68.6	67.2
B	Fishing trips in season	Av no.	5.5	4.4	10.3	6.7
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b) Motorized		5.5	4.2	10.2	6.6
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.6	15.1	12.3	13.3
F	Fisherman on-board	Av no.	6.8	8.1	6.9	7.2

Table 12: Contd.

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Porbandar	Veraval	Mangrol	Av.
2.	Jan to Mar 2015					
A	Fishing days per season	Av no.	63.4	69.2	67.9	66.8
B	Fishing trips in season	Av no.	5.0	4.6	11.0	6.9
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b)Mechanized		5.0	4.5	10.9	6.8
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	Av no.				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.8	15.4	11.7	13.3
F	Fisherman on-board	Av no.	6.6	8.0	6.9	7.2
3.	April to Sep2015	Av no.				
A	Fishing days per season	Av no.	57.6	60.5	64.3	60.8
B	Fishing trips in season	Av no.	4.5	4.0	9.5	6.0
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.0
	b)Mechanized		4.5	3.9	9.5	5.9
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	13.3	15.4	12.4	13.7
F	Fisherman on-board	Av no.	6.6	7.9	6.9	7.1
4.	Overall					
A	Fishing days per season	Av no.	62.5	65.3	66.9	64.9
B	Fishing trips in season	Av no.	5.0	4.3	10.2	6.5
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b) Motorized		5.0	4.2	10.2	6.4
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%.%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.9	15.3	12.1	13.4
F	Fisherman on-board	Av no.	6.7	8.0	6.9	7.2

Source: Field Survey Data.



The harbourwise seasonwise details on fish catch and sold is presented in Tables 13. On an average, around 14 tonnes fish per trip was caught in selected harbors. The maximum fish was landed at Veraval harbor by selected boat owners and fishermen, i.e. 14.65 tonnes/trip and the lowest was in Porbandar (12.23 tonnes/trip). Fish catch depends entirely on the size of the boats, types of fishing gear, types of nets and also the number of times the fishermen go to the sea in a day. Out of total fish landed at harbours, about 85 percent fish was of Grade I and remaining was categorized as low grade (around 15 percent), i.e. Grade II. Across the harbours, the percentage of Grade I fish ranges between 82 to 87 percent.

It was observed that not only the fish landed per trip was higher in case of boat owner than fishermen but also the percentage of Grade I quality fish was higher. About 15 percent Grade I fish was found higher with boat owner than fisherman. Besides, high percentage of fish was dumped or categorized as waste at fisherman level (4.7%) that of 1.3 percent at boat owner level which must have implication on income of fisherman. The reason for relatively high ratio of low value fish with fishermen than boat man was may be due to inadequate facilities available on board (such as washing facility) and use of dragging for hauling the fish (see, section 5.2.9). However, catch and quality are the function of fishing efforts, type of fishing gear and the nature of the fishing ground. In both cases, fish landed at Porbandar harbor was of relatively low grade quality than other two harbours namely Veraval and Mangrol. The fish used as dry/fish meal was found around 3.6 percent of total fish landed.

The sale pattern of fish landed indicates that, about 94 percent of total fish was sold, of which around 37 percent each was sold to exporter, around 29 percent to wholesaler and contractor and remaining was sold to retailer. In case of fishermen and boat owner, the percentage of fish sold to total was also around 93 percent and both groups preferred to sell one third of their output to the exporters.

Across seasons, in case of boat owner, average price per kg of Grade I fish ranges from as high as Rs. 800/- per kg for Pomfret and as low as Rs. 50/kg for prawn/rani, while Grade II fish ranges between Rs. 730/kg for Pomfret to Rs. 40/kg for red fish. In case of fisherman, Grade I fish ranges from Rs. 800/kg for Pomfret to Rs. 40/kg for red fish while for Grade II fish rate ranges from Rs. 600/kg for Pomfret to Rs. 40/kg for prawn. The simple average of price realized for Grade I for all three season by the boat owner was Rs.181/kg, while in case of fisherman, it was Rs. 172/kg. In case of Grade II fish, boat owner realized lower price of Rs. 68/kg as compared to Rs. 105/kg realized by fishermen.

Table 13: Harbourwise & Season-wise Details of Fish Caught & Sold (ALL)

Sr. No.	Harbour	Details of Fish Caught & Sold (ALL)							
		Porbandar		Veraval		Mangrol		Total	
1.	Oct - Dec 2014	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	4.20	100.0	5.33	100	4.31	100.0	4.61	100.0
	a) Grade I (high value)	3.03	72.0	4.05	76.1	3.42	79.4	3.50	75.9
	b) Grade II (low value)	1.18	28.0	1.28	23.9	0.89	20.6	1.11	24.1
B)	Fish Sold	3.94	93.9	4.98	93.6	4.09	94.9	4.34	94.1
	a)Exporter	1.14	28.9	2.69	53.9	0.82	19.9	1.55	35.6
	b)Wholesaler	0.99	25.0	1.39	27.8	1.46	35.5	1.28	29.4
	c)Retailer	0.10	2.6	0.06	1.3	0.30	7.3	0.15	3.5
	d)Contractor	1.72	43.5	0.85	17.1	1.53	37.3	1.36	31.4
C)	Fish waste/fish dumped	0.11	2.7	0.16	2.9	0.06	1.3	0.11	2.3
D)	Fish use to dry/fish meal	0.15	3.5	0.19	3.5	0.16	3.7	0.16	3.6
2.	Jan to Mar 2015								
A)	Fish landed per trip	4.19	100.0	4.62	100	4.28	100.0	4.36	100.0
	a) Grade I (high value)	3.10	74.0	3.50	75.8	3.42	79.9	3.34	76.6
	b) Grade II (low value)	1.09	26.0	1.12	24.2	0.86	20.1	1.02	23.4
B)	Fish Sold	3.92	93.6	4.22	91.3	4.04	94.3	4.06	93.0
	a)Exporter	1.57	39.9	2.00	47.4	0.86	21.3	1.47	36.3
	b)Wholesaler	1.00	25.5	1.26	29.8	1.33	32.9	1.20	29.4
	c)Retailer	0.19	4.8	0.19	4.4	0.27	6.6	0.21	5.3
	d)Contractor	1.17	29.7	0.78	18.4	1.59	39.2	1.18	29.0
C)	Fish waste/fish dumped	0.13	3.0	0.17	3.6	0.11	2.6	0.14	3.1
D)	Fish use to dry/fish meal	0.15	3.5	0.23	5.0	0.13	3.0	0.17	3.9
3.	April to Sep2015								
A)	Fish landed per trip	4.19	100.0	4.45	100	4.03	100.0	4.22	100.0
	a) Grade I (high value)	3.28	78.3	3.50	78.7	3.26	80.7	3.34	79.2
	b) Grade II (low value)	0.91	21.7	0.95	21.3	0.78	19.3	0.88	20.8
B)	Fish Sold	3.94	94.1	4.12	92.6	3.73	92.4	3.93	93.1
	a)Exporter	1.34	34.0	1.97	47.8	1.25	33.5	1.52	38.7
	b)Wholesaler	1.33	33.6	1.06	25.7	1.08	28.8	1.15	29.4
	c)Retailer	0.09	2.2	0.21	5.1	0.10	2.5	0.13	3.3
	d)Contractor	1.19	30.2	0.88	21.4	1.31	35.1	1.13	28.7
C)	Fish waste/fish dumped	0.09	2.2	0.16	3.6	0.19	4.7	0.15	3.5
D)	Fish use to dry/fish meal	0.15	3.6	0.17	3.8	0.12	2.9	0.15	3.5
4.	Overall								
A)	Fish landed per trip	12.6	100.0	14.39	100	12.63	100.0	13.20	100.0
	a) Grade I (high value)	9.40	74.8	11.05	76.8	10.10	80.0	10.18	77.2
	b) Grade II (low value)	3.18	25.2	3.34	23.2	2.53	20.0	3.01	22.8
B)	Fish Sold	11.8	93.9	13.32	92.5	11.86	93.9	12.33	93.4
	a)Exporter	4.05	34.3	6.66	50.0	2.92	24.6	4.54	36.8
	b)Wholesaler	3.31	28.0	3.70	27.8	3.86	32.5	3.62	29.4
	c)Retailer	0.38	3.2	0.46	3.4	0.66	5.6	0.50	4.0
	d)Contractor	4.07	34.5	2.51	18.8	4.42	37.3	3.67	29.7
C)	Fish waste/fish dumped	0.33	2.6	0.48	3.4	0.36	2.9	0.39	3.0
D)	Fish use to dry/fish meal	0.44	3.5	0.59	4.1	0.41	3.2	0.48	3.6

Source: Field Survey Data.

Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. There are appreciable losses during both harvest and post-harvest stages in fisheries. The harvest and post-harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. It is important to know the causes of losses of fish value, which have been presented in Table 14.

The economic losses in terms of low market value of fish due to poor post-harvest infrastructure have been estimated to Rs. 18.10 per kg. The rate of fish loss was higher during the period Oct-Dec and was the lowest during April-Sept period. The higher rate of loss was recorded by fisherman (around Rs.19/kg) as compared to boat owner (Rs.16/kg).

The major reasons for losses at this stage were physical damage during fishing and spoilage due to improper icing, whereas very minimal share was loss due to fish being eaten away by birds. The motorized trawlers followed by gill netters are major causes for fish losses.

The method of sale adopted and preferred by boat owner and fishermen was sale at pre-agreed price, followed by auction method of sale, sale to contractor and combination of above methods. The timeliness of receipt of money also matters in fishery business, especially for fishermen which are totally dependent on same.

Table 14: Nature and Causes of Losses in Fish Value

Sr. No.	Particulars	Causes of losses of fish value											
		Boat owner (n=30)				Fishermen (n=30)				ALL (n=60)			
		Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.	Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.	Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate- Rs./kg due to poor post harvest infrastructure	16.7	16.2	16.1	16.3	20.2	18.6	17.9	18.9	18.4	17.3	17	18.1
II	Causes of Fish Losses (% respondent)												
a	Physical damage during fishing-1,	40	36.7	30	35.6	30	33.3	50	37.8	35	35	40	36.7
b	Spoilage due to improper icing-2,	6.7	10	23.3	13.3	46.7	36.7	20	34.4	26.7	23.3	21.7	23.9
b	Fish eaten by birds-3,	0	0	6.7	2.2	0	0	0	0	0	0	3.3	1.1
d	Both-1& 2	53.3	53.3	40	48.9	23.3	30	30	27.8	38.3	41.7	35	38.3

Table 14: Contd...

Sr. No.	Particulars	Causes of losses of fish value											
		Boat owner (n=30)				Fishermen (n=30)				ALL (n=60)			
		Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.	Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.	Oct.- Dec. 2014	Jan.- Mar 2015	April Sept. 2015	Av.
III	Kind of craft												
a	Trawlers-1,	73.3	66.7	53.3	64.4	73.3	70	76.7	73.3	73.3	68.3	65	68.9
b	Gill neters-2,	6.7	6.7	16.7	10	23.3	20	16.7	20	15	13.3	16.7	15
c	Deep sea trawlers-3,	0	0	3.3	1.1	0	0	0	0	0	0	1.7	0.6
d	Long liner for Tuna-4,	0	0	0	0	0	0	0	0	0	0	0	0
e	Squid jigging-5,	0	0	0	0	0	0	0	0	0	0	0	0
f	Shore seining-6	0	0	0	0	0	0	0	0	0	0	0	0
g	Both 1 & 2	16.7	20	26.7	21.1	3.3	6.7	0	3.3	10	13.3	13.3	12.2
h	Both 2&3	3.3	6.7	0	3.3	0	3.3	6.7	3.3	1.7	5	3.3	3.3
IV	Method of sale												
a	Auction-1,	30	36.7	26.7	31.1	23.3	26.7	26.7	25.6	26.7	31.7	26.7	28.3
b	Pre-agreed -2,	33.3	23.3	53.3	36.7	30	26.7	26.7	27.8	31.7	25	40	32.2
c	Contract 3	30	23.3	6.7	20	23.3	20	23.3	22.2	26.7	21.7	15	21.1
d	Auction + Pre agreed	0	3.3	10	4.4	13.3	16.7	13.3	14.4	6.7	10	11.7	9.4
e	Pre agreed + Contract	6.7	13.3	3.3	7.8	10	10	10	10	8.3	11.7	6.7	8.9
V	Receipt of money												
a	In advance-1 ,	33.3	43.3	43.3	40	60	60	63.3	61.1	46.7	51.7	53.3	50.6
b	On same day-2,	0	0	6.7	2.2	0	0	3.3	1.1	0	0	5	1.7
c	In week time-3	0	0	0	0	0	0	0	0	0	0	0	0
d	In 15 days-4	26.7	16.7	16.7	20	16.7	16.7	10	14.4	21.7	16.7	13.3	17.2
e	Both- 1& 4	20	23.3	10	17.8	13.3	10	13.3	12.2	16.7	16.7	11.7	15
f	Both 1 & 2	20	16.7	23.3	20	10	13.3	10	11.1	15	15	16.7	15.6

Source: Field Survey Data.

It was observed that on an average 50 percent of respondent mentioned that they had received money in advance while corresponding figures for fishermen and boat owner were 61.1 and 40 per cent respectively. Thus, 60 per cent fishermen received money in advance, while remaining amount was received in mix way, i.e. some advance and some after 15 days or so. In case of boat owner, 20 percent respondent received money after a 15 day time.


The details on time and cost incurred in fishing activity per trip are presented in Tables 15. The total operational expenditure incurred has been estimated to be Rs. 1.71 lakh/per visit comprised of expenditure on food and water, fuel cost, ice cost, hired labour and other miscellaneous items.

Table 15: Details on Time and Cost incurred in Fishing Activity per trip

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity per trip (ALL)			
			Porbandar	Veraval	Mangrol	Overall
1	Fishing nets/gears taken per fishing trip	Av. No.	13.4	16.8	15.1	15.1
2	Distance of the fishing ground from the shore	Nautical miles	88.2	180.9	109.0	126.0
3	Approximate time taken for fishing	hrs.	130.3	174.1	118.5	141.0
4	Approximate time taken for landing/unloading					
	a) Handling by (Machine) Mechanical Device	hrs.	26.0	40.1	28.6	31.6
	b) Handling Manually	hrs.	4.1	2.9	2.7	3.2
5	Quantum of fuel taken on board the vessel (diesel)	Liters	2267.5	3515.0	2282.5	2688.3
6	Fuel utilized per each trip	Liters	1947.5	3110.0	2026.5	2361.3
7	Operational expenses/trip					
	a) Exp. on Food & Water	Rs.	9200	15250	9675	11375
	b) Fuel Cost	Rs.	94064	150213	97880	114052
	c) Hired labour cost	Rs.	24900	38900	26200	30000
	d) Ice cost	Rs.	3900	5650	4625	4725
	i) total quantity	kg	9100	11550	7550	9400
	ii) Rate	Rs./Kg	1.3	1.2	1.3	1.2
	e) Any other expenditure	Rs.	11303	13552	10121	11659
	f) Total Cost	Rs.	143367	223565	148501	171811

Note: 1 Nautical mile= 1.852 km.
Source: Field survey data

There was huge difference in cost incurred by respondents of three selected harbors. The highest cost was incurred by the respondents from Veraval harbor (Rs. 2.24 lakh) while the lowest cost was recorded by respondents from Porbandar harbor (Rs. 1.44 lakh per trip). The high cost per trip at Veraval respondent would be due to longer time taken for fishing (174.1 hours). Around two third of total cost was incurred on fuel only, followed by about one fifth of total cost on hired human labour for fishing activity. Thus, these two costs put together accounted for about 84 percent of total cost. The expenses on food with water and miscellaneous expenditure accounted for around 7 percent each to total cost. The same trend was in case of fishermen and boat owner except ice cost and quantity. The total quantity of ice used by boat owner per trip was 4725 kg as compared to 2767 kg by fisherman.



The infrastructural facilities available on board play an important role in reducing the post harvest losses. It can be seen from the Table 16 that at overall level at overall level, fish hold capacity of fishing vessel was 10.7 tonnes/boat, which was almost same in case of both boat owner and fisherman. The average number of ice boxes available were 11.17 having capacity of 480 kg. It is important to note that no fishing boat had insulated box on board. The lifting facilities were available on about 53 percent boats while dragging facility was with remaining ones. The status of fish hold in both categories and at all three harbors was fresh one. The washing and cleaning facility was available on about 83 percent craft, while 17 percent were not having this facility. However, in case of boat owner, all the fishing boats/craft had this facility.

Further, all selected respondents had on board processing facility. Among the various processing facilities, icing facility was available on all fishing crafts of both fishermen and boat owner, having average capacity of about 10 tones. However, no boat had other processing facilities like freezing facility, canning facility, smoking facility, smoking facility and any other facility on board. The sorting of board facility was available on all the crafts used by fishermen and boat owners. On an average 1.22 hours were spent in sorting/grading of fish on board. Veraval respondents had spent relatively more in grading the fish on board as compared to other two harbor respondents. Thus, icing facility was available on board for all crafts and sorting was done on board by the fishermen and boat owner.

The details on low value fish is presented in Table 17 indicate that at all three harbors and by both categories, no fish (young fish) was categorized as low value fish, while due to spoilage, about 0.3 tons of fish per trip has been treated as low value. Out of total spoilage, 61.32 percent is classified as by catch which was used for fish meal.

Fishing harbours are being developed at both major and minor ports. The status of availability and condition of facilities at selected three harbors as mentioned by the respondent fishermen and boat owners presented in Table 18 shows that at overall level, on average about 72 percent respondents were satisfied with landing platform. Half of the respondents from Veraval harbor were not satisfied with condition of landing platform. The condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. At the time of survey, we were informed that new facilities creation is in progress in order to improve the prevailing condition at these harbors.

Table 16: Infrastructural Facilities Available on Board of Fishing Vessel

Sr. No.	Particular	Infrastructural facilities available (ALL)			
		Porbandar	Veraval	Mangrol	Overall
A	Fish-hold capacity (tons)	10.5	11.8	9.65	10.65
B	Ice boxes (No.)	11.3	11.8	10.4	11.17
C	Capacity in Kg	465	545	430	480
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	45	40	55	46.67
	b) Lifting	55	60	45	53.33
F	Status of Fish hold (%)				
	a) Fresh	100	100	100	100.00
	b) Not Fresh	0	0	0	0.00
	c) Spoiled	0	0	0	0.00
G	Washing/cleaning facilities onboard (%)				
	a) yes	65	95	90	83.33
	b)No	35	5	10	16.67
H	Vessel has on-board processing facility – Yes (%)	100.0	100.0	100.0	100.0
	a) Icing facility	100.0	100.0	100.0	100.0
	Icing capacity (in tons)	9.5	10.65	9.8	9.98
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.00	1.53	1.14	1.22

Source: Field Survey Data.

Table 17: Details on Low Value of Fish (All)

Sr. No.	Particular	Details on Low Value of Fish/trip-All			
		Porbandar	Veraval	Mangrol	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	0.0	0.0	0.0	0.0
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.31	0.28	0.30	0.30
3	Percentage is classified as by-catch (use for fish meal)	66.95	58.22	58.75	61.32

Source: Field Survey Data.

Table 18: Facilities on the Sea Shore (All)

Sr. No.	Particular	Facilities on the shore (% to total) ALL-% (n=60)			
		Porbandar	Veraval	Mangrol	Overall
A	Landing platform				
	a) Satisfied	80.00	50.00	85.00	71.67
	b) Unsatisfied	20.00	50.00	15.00	28.33
B	Washing/cleaning facilities available				
C	a) satisfactory-1,	10.00	0.00	10.00	6.66
	b) unsatisfactory-2,	70.00	0.00	60.00	43.33
	c) very poor-3	20.00	100.0	30.00	50.00
	Storage facilities	100.00	100.00	0.00	66.67
	i) Chill plants	0.00	0.00	0.00	0.00
	ii) Cold storage	0.00	0.00	0.00	0.00
	iii) ice plants	0.00	0.00	0.00	0.00
	iv) Flake ice plants	100.00	100.00	0.00	66.67
v) Insulated vans	0.00	0.00	0.00	0.00	
D	Drainage facilities				
	a) Yes	35.00	30.00	45.00	36.67
	b) No	65.00	70.00	55.00	63.33
E	Communication & approach facilities				
F	a) Satisfactory	40.00	35.00	45.00	40.00
	b) Unsatisfactory	40.00	45.00	20.00	35.00
	c) Very poor	20.00	20.00	35.00	25.00
	Drinking water facilities				
	a) Satisfactory	10.00	40.00	30.00	26.67
	b) Unsatisfactory	35.00	25.00	35.00	31.67
c) Very poor	55.00	35.00	35.00	41.67	
G	Parking facilities				
	a) Satisfactory	0.00	0.00	0.00	0.00
	b) Unsatisfactory	5.00	50.00	50.00	35.00
	c) Very poor	95.00	50.00	50.00	65.00
H	Toilet/sanitation facilities				
	a) Satisfactory	15.00	15.00	70.00	33.33
	b) Unsatisfactory	15.00	45.00	40.00	33.33
	c) Very poor	70.00	35.00	30.00	45.00
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

All the respondents opined that out of three harbours, two harbours namely Porbandar and Veraval harbor had good storage facility, i.e. flake ice plants. It was very unlikely to mention here is that more than 60 percent of respondent mentioned that facilities like drinking water, parking facilities, toilet/sanitation facilities, drainage facilities, commutation and approach facilities are unsatisfactory or very poor. It was expected that when the basic infrastructure at sea shore is so poor, facility of solar dryer was not available. Therefore, state government should take necessary steps to create required facilities at sea shore on war footing level.

The details on distance of facilities away from sea shore indicate that on an average, the facilities like chill plants, cold storage, ice plants and insulated vans are available about 3 kms away from sea shore. These facilities were available relatively closer to Veraval and Mangrol harbor than Porbandar harbor. Flake ice plant facility was much closer to Porbandar harbor than other two harbours. In order to transport the raw fish, availability of insulated van facility was very rarely available in selected three harbors in Gujarat. Mostly trolley was used for transport of raw fish followed by use of ice boxes for same. The grading and sorting of raw fish was done on board by both boat owner and fishermen of all three harbors.

The respondents were asked to share and rank their suggestions on important post harvest facilities to minimize losses of fishes. Tables 19 present, at overall level, the highest number of respondents (46.7 per cent) ranked I to the facility of having clear landing platform with washing and drainage facilities followed by facility of cold storage/chill plants with in the FH premises (36.7 per cent) and insulated storage boxes on board the fishing vessel (16.7 per cent). The same preference was recorded by the respondents of Veraval and Mangrol. While in case of Porbandar, preference was not same. Porbandar respondents ranked I to the facility of cold storage/chill plants with in the FH premises while facility of cold chain network was ranked as less preferred facility in all three harbours. Same trend was observed in case of fisherman and boat owner.

It was observed that about 32 percent respondents had incurred loss of 2-5 percent of total sale value, while 25 and 15 percent respondents incurred loss between 5-10 and 10-25 percent of total sale value respectively. Across the harbor, the trend was same, while across category, it was not same. Due to inadequate facilities, about 57 percent fishermen had incurred loss between 5-15 percent (of total sale value), while 37 percent boat owners incurred loss in this range. Thus, fishermen were at more loss than boat owner due to inadequate facilities. Therefore, necessary post harvest facilities need to be created on war footing basis.

Table 19: Important Post-harvest Facilities to Minimize Losses of Fishes

Sr. No.	Particulars	Important Post harvest facilities to minimize losses of fishes-ALL															
		Porbandar				Veraval				Mangrol				Overall			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	A cleaner landing platform with washing and	35.0	35.0	30.0	0.0	65.0	25.0	10.0	0.0	40.0	30.0	30.0	0.0	46.7	30.0	23.3	0.0
2	Insulated storage boxes on board the fishing	10.0	40.0	50.0	0.0	5.0	35.0	60.0	0.0	35.0	40.0	20.0	5.0	16.7	38.3	43.3	1.7
3	Cold storage/chill plants with in the FH	55.0	25.0	20.0	0.0	30.0	40.0	30.0	0.0	25.0	20.0	50.0	5.0	36.7	28.3	33.3	1.7
4	Cold Chain facility network	0.0	0.0	0.0	100	0.0	0.0	0.0	100	0.0	10.0	0.0	90.0	0.0	3.3	0.0	96.7


Note: Rank is given by the respondent (most important to relatively less important- rank I to IV)
Source: Field Survey Data.

The major problems cited by the fishing households were storm, cyclone, tsunami, high wave, raining, bathing, poor facilities for bathing and drinking water and incidence of skin diseases. The non availability of cold storage facility was major problem under storage category. Non availability of additional subsidy on fuel and inadequate supply of fuel were other problems cited.

5.2 Marketing of Fish and Fish Products

All the fish landing centres are primary fish markets from where fishes are transported to the wholesale or retail markets. The retail markets are located in major towns and cities in the state. There was a sharp increase in the prices of many of the highly preferred species in the state in recent years owing to the increased demand from both domestic as well as export sectors.

The technological improvements in the transport and processing of



marine fish facilitated fish from distant harbours to reach wholesale and retail markets in the state. However the perishable nature of fish compelled its quick disposal at each point of transaction and has resulted in the involvement of more intermediaries in the marketing channel leading to high marketing costs and margins.

As there is a big gap between supply and demand, fish marketing or fish business is very profitable. The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or Fish Traders' Associations or Fishermen's Cooperative Societies. Four levels of markets or marketing systems are observed in the distribution channel of fish trade i.e. fish wholesaler/trader- processor / exporter – retailer- consumer.

Fish Wholesale Markets

Wholesale fish markets are not well developed throughout the state. Fish landing centres are administered mutually by Fishery Department and fishermen association. Though some of the landing centres are well developed, some lagged behind due to the poor participation of all stakeholders. The average wholesale price of Pomfret varied from Rs. 529 per kg during January-March to Rs 553 per kg during April to September (Table 20). The wholesale price of Pomfret varied from Rs. 476 per kg in Mangrol to Rs 567/kg in Veraval and Porbandar during Season I (October to December). However, the price of Pomfret has gone up to Rs 637.5 per kg in Porbandar during Season III (April to September), basically due to poor catches and increase in demand.

It may be seen from Table 21 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I and Season II was to the tune of 6-10 per cent in case of 60 per cent of wholesalers in Porbandar harbor. However, during Season III, 6-10 per cent loss was experienced by 40 per cent of wholesalers in same harbor. The higher extent of losses (11-15%) was faced by 20 per cent of wholesalers during Season I and III, whereas such range of losses was not found in Season II in Porbandar harbor. Relatively, the percentage of losses in fish value due to poor post harvest infrastructure to the tune of 11-15 per cent was the highest in Veraval and was lowest in Porbandar. On the other hand, the percentage of losses in fish value in the lower range (to the tune of 1-5 per cent) was more in Porbandar and was the lowest in Veraval harbour.

Table 20: Season-wise Details of Fish Purchases by All Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases(n=15)			
		No. of wholesalers	Total Quantity of fish	Rate of Fish	Selling prices
		(WS)	(tonnes/WS)	(Rs./ Kg)	(Rs./ Kg)
I	October to December 2014				
	Croaker	2	148.33	75.83	95.00
	Cuttle fish	4	673.33	86.25	111.25
	Perches	1	233.33	47.50	62.50
	Pomfret	4	696.67	497.67	536.56
	Prawn	3	1345.00	114.00	143.33
	Rani fish	3	117.33	47.22	69.86
	Ribbon fish	5	1003.33	75.67	95.80
	Squid	3	248.33	67.22	88.89
	Cat fish	1	90.00	51.67	61.67
	Crab	1	50.00	31.67	43.33
	Sole Fish	1	26.67	78.33	91.67
	Tuna	1	16.67	16.67	20.00
II	January to March 2015				
	Croaker	1	173.33	77.50	98.17
	Cuttle fish	3	543.33	104.17	128.89
	Perches	2	120.00	55.00	62.50
	Pomfret	4	590.00	499.77	529.22
	Prawn	2	361.67	103.50	125.58
	Ranifish	3	185.00	44.44	59.44
	Ribbonfish	4	850.00	73.83	94.25
	Squid	3	210.00	66.25	88.33
	Crab	1	126.67	35.00	46.67
	Cat fish	1	43.33	46.67	58.33
	Sole fish	1	33.33	65.00	73.33
	Tuna	1	60.00	23.33	32.50
III	April to September 2015				
	Croaker	2	213.33	85.83	111.94
	Cuttle fish	4	546.67	96.72	116.39
	Perches	1	116.67	50.00	60.00
	Pomfret	3	430.00	569.50	552.58
	Prawn	3	230.00	83.97	108.90
	Ranifish	3	92.67	63.17	81.50
	Ribbonfish	5	891.67	74.33	94.00
	Squid	3	291.67	61.66	80.00
	Crab	1	93.33	50.00	66.11
	Sole fish	1	16.67	21.67	23.33
	Tuna	1	60.00	73.33	86.67

Source: Field Survey Data.

Table 21: Detail of Loss incurred by Wholesaler due to Poor Post Harvest Infrastructure

Sr. No.	Harbour/Loss Range	Loss in wholesale market		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
	1-5 %	20.0	40.0	40.0
	6-10 %	60.0	60.0	40.0
	11-15 %	20.0	0.0	20.0
B	Veraval (n=5)			
	1-5 %	20.0	20.0	0.0
	6-10 %	40.0	40.0	40.0
	11-15 %	40.0	40.0	60.0
C	Mangrol (n=5)			
	1-5 %	0.0	20.0	20.0
	6-10 %	60.0	40.0	40.0
	11-15 %	40.0	40.0	40.0
D	All (n=15)			
	1-5 %	13.3	26.7	20.0
	6-10 %	53.3	46.7	40.0
	11-15 %	33.3	26.7	40.0

Source: Field Survey Data.

The average capacity of wholesale market varied from 48 tons per day in Porbandar to 66 tons per day in Mangrol. About 87 percent wholesale markets have linkage with other markets and consuming centres. Mainly insulated vehicles (80%) were used for transport of fish from the harbor to the wholesale markets.

Among the types of cold storage facilities availed by wholesalers, freezer boxes were major ones that used by about 73 per cent wholesalers, while remaining 27 per cent had used cold storage facility. About 80 per cent respondents could get regular fish supply and about 87 per cent got the fish of assured quality. About 80 per cent of them had the capacity to hold huge supplies. On an average, 20 people were engaged with a wholesaler. As far as mode of marketing is concerned, open auction method was followed by 80 per cent wholesalers in Porbandar whereas 60 per cent wholesalers in Mangrol resorted to direct sale method of marketing.

Wholesalers did not face many difficulties in terms of supply, marketing and upkeep of the markets. Only about 27 per cent wholesalers expressed that they faced problem of market storage facilities.

Fish Retail Markets

The local retail markets for marine fishes catered the need of local people in the cities and nearby areas. However, during the survey, it was found that there were no proper shops/buildings for marketing of fish in retail. The fishes were sold on the roadside without facility of proper roof, electricity, water, drainage, storage room and proper flooring. At some places, small platforms were constructed in the market. There were no proper lavatory and washing facilities in most of the retail markets. The hygienic conditions were also very poor. Fishes were piled up on the floor and sold. Majority of retail fish markets those were visited by the research team are found to be ill-managed and unhygienic. There were no proper handling, washing, cleaning, icing or re-icing of the fishes in the market places.

The majority of fish retailers were women (90%). The average age of retailers was about 48. Only about 33 per cent of them were literate. The literacy rate of Female retailers was better in Porbandar harbor compared to other places.

The major sources of purchase of fish by the retailers were the brokers or middle men. About 70 per cent of total fishes were purchased by retailers through the brokers/middlemen. Entire fishes in the retail market were sold to the consumers coming from the nearby areas.

It may be seen in Table 22 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I was to the tune of 6-10 per cent in case of 60 per cent of retailers in Porbandar market. However, during Season III, the 6-10 per cent loss was experienced by 30 per cent of retailers in the same harbor. The higher extent of losses (16-20%) was not faced by any retailers during any seasons in Porbandar, however such range of losses was found in other harbors.

The major facility required by the fish retailers was availability of ice to keep the fish afresh in the market places as well as in their storage boxes. About 93 per cent of selected sample retailers got ice in adequate quantity and about 90 per cent of them could get ice in time and uninterruptedly. On the whole, only about 33 per cent retailers expressed that ice price was more or less stable throughout the year. The average ice price in retail market was around Rs.1.25 per kg.

The details of status of the fish retail markets in selected harbors are presented in Table 23. The average capacity of the retail market varied from 42 tons per day in Porbandar to 75.5 tons per day in Veraval. All the retailers used non-insulated vehicles for transport of fish from the harbor or wholesale markets and to the retail markets due to lesser distance.

Table 22: Detail of Loss incurred by Retailer due to poor post harvest infrastructure


Sr. No.	Harbour/Loss Range	Loss in value due to inadequate post harvest infrastructure Retailer (%)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
1	1-5 %	30.0	40.0	50.0
2	6-10 %	60.0	40.0	30.0
3	11-15 %	10.0	20.0	20.0
4	16-20%	0.0	0.0	0.0
B	Veraval (n=5)			
1	1-5 %	20.0	30.0	0.0
2	6-10 %	50.0	40.0	60.0
3	11-15 %	20.0	30.0	30.0
4	16-20%	10.0	0.0	10.0
C	Mangrol (n=5)			
1	1-5 %	30.0	30.0	20.0
2	6-10 %	50.0	30.0	60.0
3	11-15 %	10.0	30.0	20.0
4	16-20%	10.0	10.0	0.0
D	All (n=15)			
1	1-5 %	26.7	33.3	23.3
2	6-10 %	53.3	36.7	50.0
3	11-15 %	13.3	26.7	23.3
4	16-20%	6.7	3.3	3.3

Source: Field Survey Data.

Table 23: Status of Retail Fish Market

Sr.	Particulars	Units	Status of Retail Fish Market			
			Porbandar	Veraval	Mangrol	Overall
1	Capacity of the Retail market	(Tons Per Day)	42	75.5	56.5	58
2	Type of transport vehicles	Insulated-	0	0	0	0
		Non-Insulated	100	100	100	100
3	Type of cold storage	Cold Storage	0	0	0	0
		Freezer Boxes	0	0	0	0
		Chill Plants-	0	0	0	0
		Ice Box	100	100	100	100
4	Fish supply is regular	Capacity Of Box	46	39	38	41
		Yes	100	100	100	100
5	Fish supply in assured qualities	No	0	0	0	0
		Yes	100	100	100	100
6	The fish market has the capacity to hold huge supplies in times of	No	0	0	0	0
		Yes	100	100	100	100.00
7	How the marketing activities are	Direct Sale	100	90	100	96.67
		Open Auction	0	10	0	3.33
8	Staff involved in his retail business	Numbers	1	1.2	1.4	1.2

Source: Field Survey Data.



Among the types of cold storage facilities availed by retailers, ice boxes were the major ones that used by all the retailers. Also all the retailers could get regular fish supply in assured quality and they had the capacity to hold huge supplies. As far as mode of marketing is concerned, direct sale method was followed by about 97 per cent retailers. Mostly single member had handled the fish selling in retail market.

Fish Consumers

About 57 per cent respondent buyers were from age group of 20-40 years while about 43 per cent were having age more than 40 years. Occupation-wise, buyers came from all sections, but majority were in service (26.7%) as the selected retail markets were located mainly in urban areas.

The consumers have purchased the fish four days in a week. Majority of consumers purchased cuttle fish, squid, ribbon fish, jinga and pomfret. The average quantity of purchase was 0.89 kg per visiting day. All the consumers expressed that they used to get desired type and quality of fish since all these markets are located very close to main harbor areas. About 83 percent of the consumers reveal that the average price was reasonable. Across the selected harbors, there were no major variations in the types of purchases made by the consumers.

Fish Processors and Exporters

Fish is one of the most perishable items among the foodstuff. It cannot be stored in normal temperature overnight. Processing aims at controlling, if not totally arresting the process of spoilage and make the fish available in variety of forms acceptable to the consumers. There are several methods of processing and preservation of fish. The main methods are curing, caning and freezing. Processing channels are crucial for fisheries sector as all fish items mean for export marketing need to pass through these channels.

The harbor wise capacity and utilization of processing plant shows that the average installed capacity for processing seafood in a sample processor in Gujarat was 57.9 tons per day with utilization capacity varied from 58.3 to 72.4 percent in different seasons. The installed capacity of an average processing plant in Porbandar was 80.3 tons per day which was higher than that in Veraval (52.8 tons per day) and Mangrol (40.8 tons per day). However, the capacity utilization in processing plant was higher in Veraval as compared to Porbandar and Mangrol. In Veraval, the utilization capacity of plant varied from 71.1 to 82.0 per cent across different seasons; whereas the same in Porbandar and

Mangrol varied from 56.7 to 77.9 per cent and from 44.8 to 49.1 per cent, respectively. The season-wise details of fish taken for processing have been presented in Table 24.

Table 24: Season-wise Details of Fish Taken for Processing

Sr.	Season-wise	Season-wise detail of fish taken up to processing				
		Quantity of fish taken for processing (ton)	Rate of Fish Purchase (Rs./ Kg)	Processed output quantity (ton)	Sold prices (Rs./ Kg)	Economic loss (Rs./ Kg)
A	Porbandar					
	Oct-Dec 2014	3800	162.5	3537.5	250	23.75
	Jan-March 2015	2875	200.0	2650	287.5	28.75
	Apr-Sept 2015	3250	187.5	2950	337.5	27.5
B	Veraval					
	Oct-Dec 2014	3875	188.75	3412.5	317.5	33.75
	Jan-March 2015	3050	182.5	2787.5	300	30
	Apr-Sept 2015	3250	187.5	3037.5	325	30
C	Mangrol					
	Oct-Dec 2014	1975	207.5	1750	362.5	36.25
	Jan-March 2015	2300	175.0	2075	337.5	35
	Apr-Sept 2015	2250	163.75	2025	305	30
D	Overall					
	Oct-Dec 2014	3216.67	186.25	2900.00	310.00	31.25
	Jan-March 2015	2741.67	185.83	2504.17	308.33	31.25
	Apr-Sept 2015	2916.67	179.58	2670.83	322.50	29.17

Source: Field Survey Data.

On an average, a selected processor had purchased fish of 2741.7 tons to 3216.7 tons at the rate of Rs. 179.6 to 186.3 per kg for processing in a season. Overall, the processed quantity sold during a season varied from 2504.2 tons to 2900.0 tons; whereas the selling price varied from Rs. 308.3 per kg to Rs. 322.5 per kg. Overall, the economic loss varied from Rs. 29.2 per kg in Season III to Rs. 31.3 per kg during Seasons I and II.


Overall 66.67 per cent of sample processors purchased the fish from both wholesale market and fishermen and 8.33 percent of them purchased fish from broker/middleman + fisherman. Only 16.67 per cent respondents had purchased fish from fisherman and 8.33 per cent has purchased from wholesale market directly.

As far as processed fish and fish products sold by the processors is concerned, overall 90.9 per cent of the processors sold the product to exporters; whereas only 9.1 per cent of them sold in domestic market. In Porbandar, 92.0 per cent processors sold their quantity in export market whereas in Veraval and Mangrol, 91.0 per cent and 90.87 per cent fish was sold to export market, respectively.

The major fishing harbors are important primary trading centres also. The agents of exporters also operated in these centres as the major export oriented items like shrimps, squids, cuttlefish and high value finfishes were landed at these centres. Insulated van and fishes stacked like ice box, thermal box, and insulated box were used by the processors involved in fish trade for transporting fish to distant markets. On the whole, 33.3 per cent processors used insulated vans for transport of raw fish from harbor to distant centers. In Porbandar, all processors used insulated vans, while in other harbors, none of the processor used insulated vans. All the processors in Porbandar used ice box for fish staking whereas 75 per cent processors in Veraval and 50 per cent processors in Mangrol used ice boxes for the same. Overall, about 83.3 per cent of processors did grading and sorting of fishes in the processing plants; whereas only 16.67 per cent of them relied on on-board sorting of fishes.

The main task facing these companies/ plants is to comply with various certifying agencies such as EIA (Export Inspection Agency of India), EU (European Union), F&D act of USA, HACCP (Hazard Analysis and Critical Control Point) etc. All the sample processing plants were complied with EIA norms, HACCP norms and were registered with the Marine Products Exports Development Authority (MPEDA). About 58.33 per cent processors were complied with EU norms and F&D of USA.

The harbor wise details on value addition by processors indicate that, about 75 per cent of total quantities of fish were used for export as frozen fish and remaining 25 per cent as whole fish plus frozen. Overall 80 to 90 per cent of total processed quantity of fishes were exported to Europe, Japan, US, China, Vietnam, Dubai, Italy and South Korea and 10-20 per cent of total quantity of processed fish products were sold in Delhi, Ahmadabad Jodhpur, Mumbai, Surat, Vadodara, Anand, Pune and other domestic markets. Overall about 75 per cent processed products were ready to cook and eat.




As opined by the processors, the modernized post-harvest facilities are essential to minimize post-harvest losses of fish and fish products. The data on perceptions of the processors regarding the required improvements in post harvest infrastructures so as to minimize the losses indicate that about 58.3 per cent of processors have revealed first preference to insulated storage boxes on board. They have assigned second preference to clean landing platform with washing and drainage facilities and third preference to cold storage/chill plants facilities.

Harbourwise analysis reveals that processors in Veraval have attached more importance to insulated storage boxes on board followed by the requirement of cleaner landing platform with washing and drainage facilities in their harbor. Both these facilities are also assigned more importance in other two harbors also. About 75 per cent sample processors in Porbandar and Mangrol have assigned forth preference to cold chain network facility while about 75 per cent of Veraval processors have assigned forth preference to cold storage/chill plants within the fish harvest premises.

6. Policy Suggestions

- The post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period.
- It was observed that the post-harvest fish losses occur at all stages in the fish supply chain from capture to consumer. Huge physical and quality losses were found to occur in supply chain, with economic losses reported to account for around Rs. 18/kg mainly due to poor post-harvest infrastructure. The handling and processing with minimum spoilage is a distant reality and considerable attention needs to be paid on this aspect.
- In governments and development agencies should ensure that changes in post-harvest fisheries-related policy and practices take stock of the loss assessment tools, information generated and experience of the programme. Fish loss assessments should be incorporated into national data collection systems and used regularly to inform policy.
- The fishermen and boat owners should be provided training on proper handling, transport and processing of fishes by the government and cooperative organization.
- Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at




selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured.

- The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus in view of less availability of ice, the quality of fish deteriorates very speedily.
- The dredging problem i.e. loading and unloading of fish due to non-navigable depth near sea shore has been faced by fishermen and therefore harbors dredging needs to be carried out regularly.
- It was reported that the prices of fish generally drop down sharply when there is glut in the market mostly during the rainy season (October to December), and therefore marketing and processing activities need to be strengthened by the government. Balancing technical interventions to improve fish quality with the potential increase in selling prices, associated with better quality fish with the demand for cheaper fish by low income consumers, is an important dilemma.
- The fish breeding places need to be protected from encroachment as well as fishing activity should be strictly prohibited during the ban period.
- The dumping of hazardous chemical waste from industries located nearby sea shore (particularly at Veraval and Porbandar) not only affect the fish quality due to polluted water but also results in dying and moving away of good species of fish from the harbor area. That force the fishermen to go far way (till Pakistan border) to catch good fish. Therefore, dumping of industrial waste should be prohibited effectively.
- The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor. Therefore, there is a need of expansion of harbor regions as well as constructions of more number of jetting/landing platforms.
- The limited availability of funds and inadequate staff with fisheries department at harbor level hinder the overall supervision as well as progress in development of infrastructure in harbor region. Therefore, level of administrative and financial autonomy at harbor should be increased with sufficient fund availability so that infrastructure and developmental activities at harbor regions can be stepped up.
- Though it is prohibited by the law, the catching of young fish is still continuing on larger scale which affects the future growth of fish volume and thus fish management in region. Therefore strict monitoring of catching of young fish at harbor level need to be undertaken.

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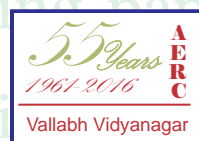
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